



Synthesis and Design of Processing Networks: Stochastic Formulation and Solution

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1. Introduction

Objectives:

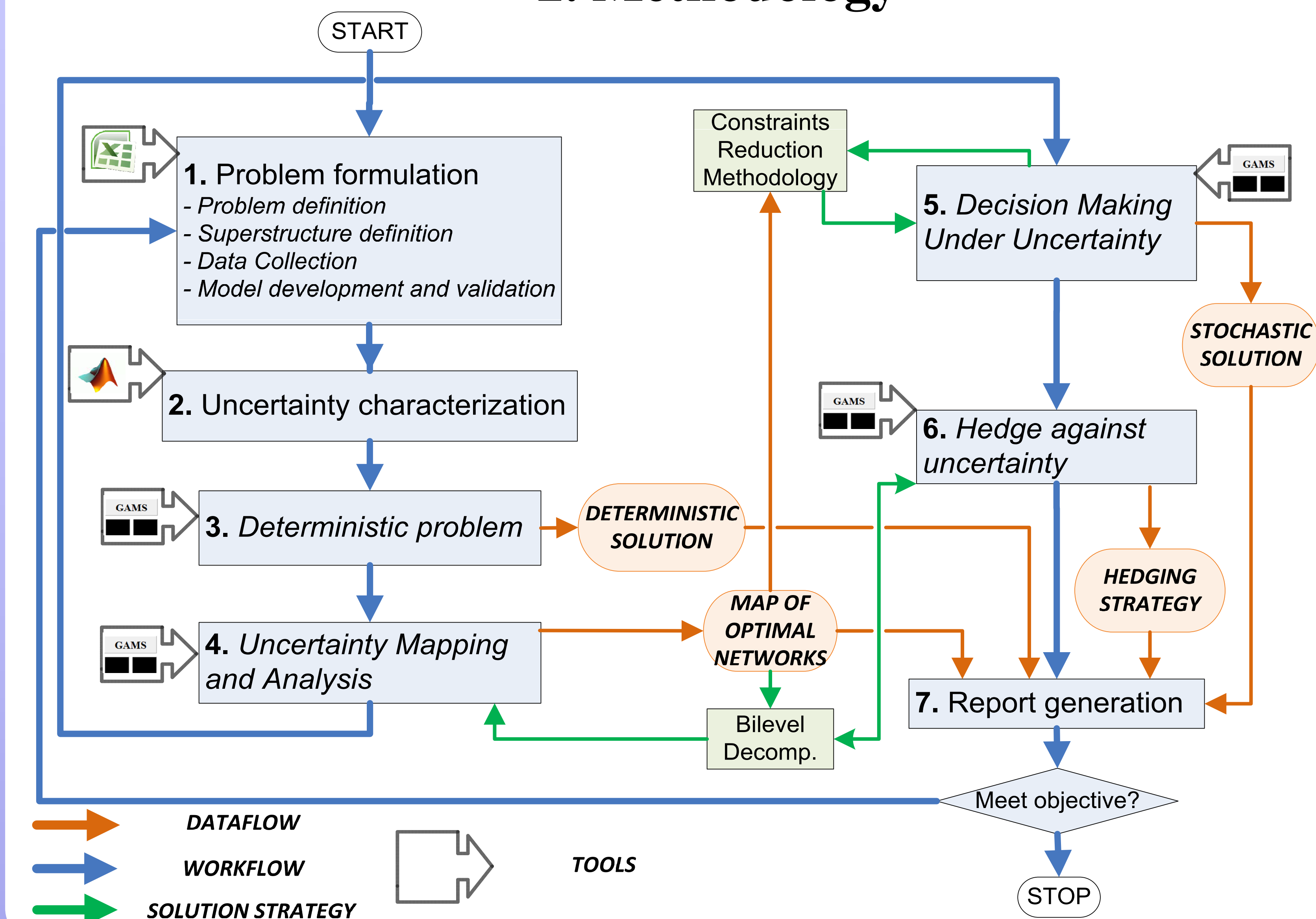
Development of a systematic framework for synthesis and design of processing network under uncertainty.

Integration of software, tools, methods and solution strategies into a generic toolbox for the solution of networks synthesis problems.

Demonstration of the developed framework through the formulation and solution of industry oriented case studies

Case Study: Soybean Processing Network
(in collaboration with Alfa Laval)

2. Methodology



3. Case Study: Soybean Processing network

1. Problem Formulation

Objective function: max NPV

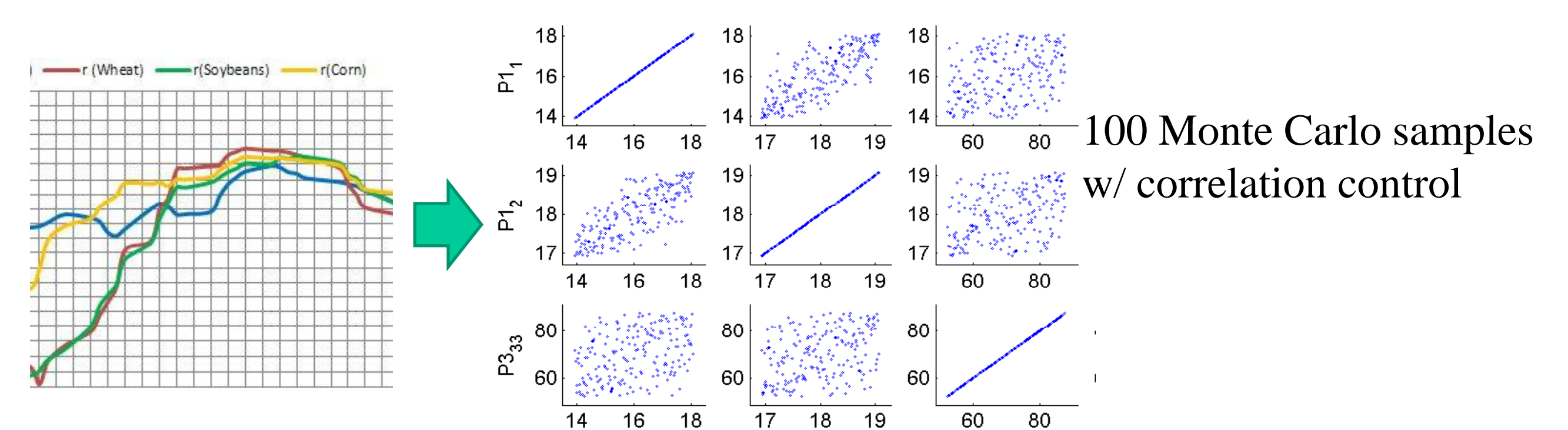
2 raw materials, 42 processing technologies, 21 products

300,000+ equations, 140,000+ variables (deterministic)

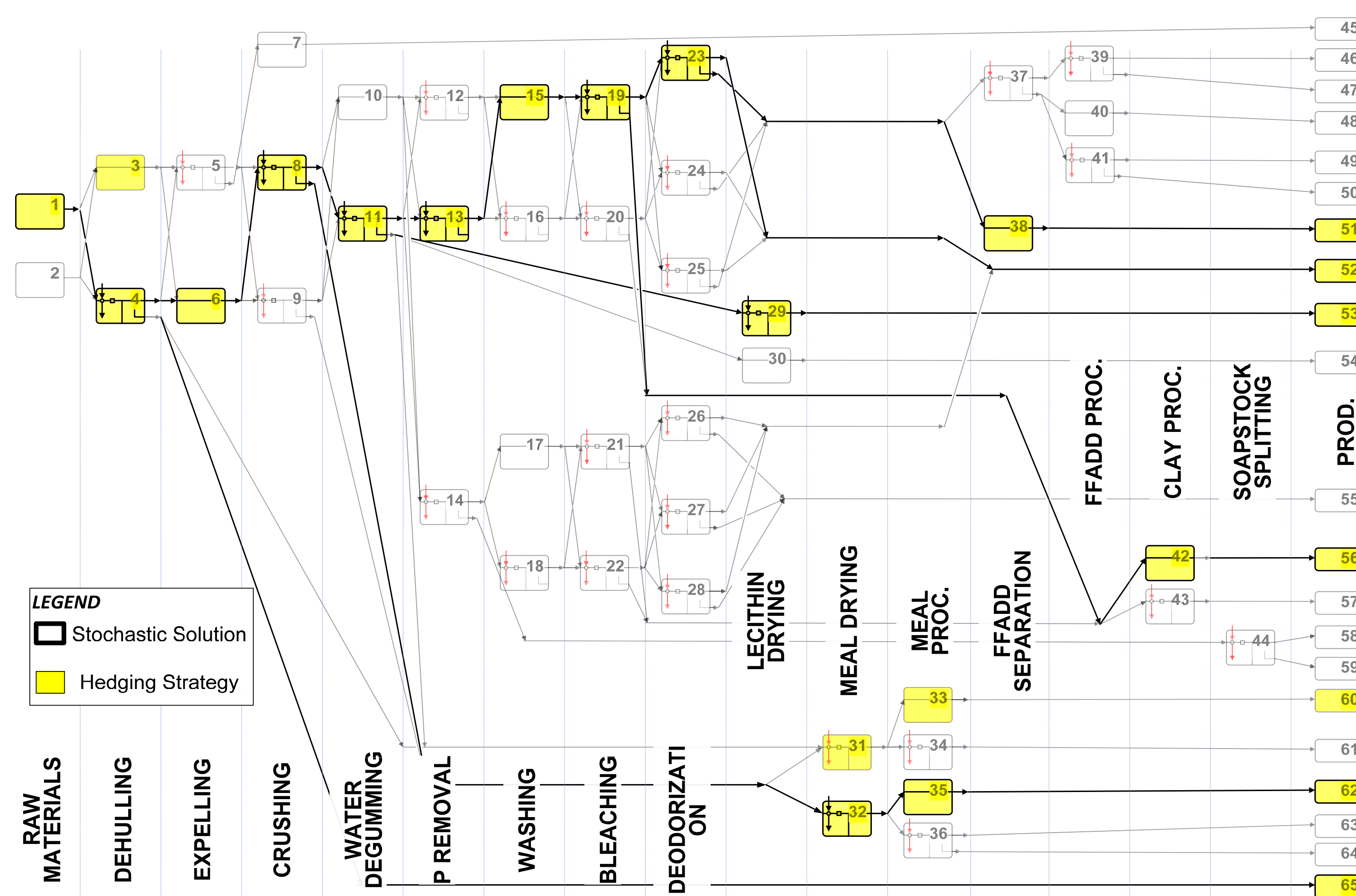
11 uncertain data (sources: technical, market, supply chain)

entire value chain considered

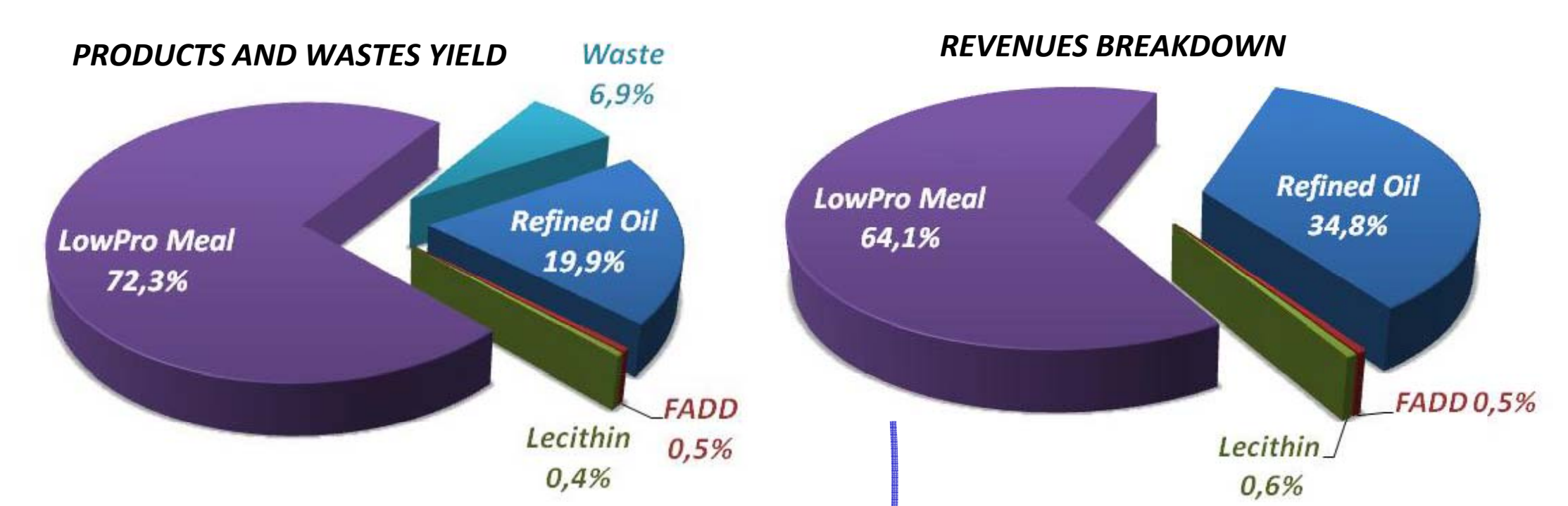
2. Uncertainty Characterization



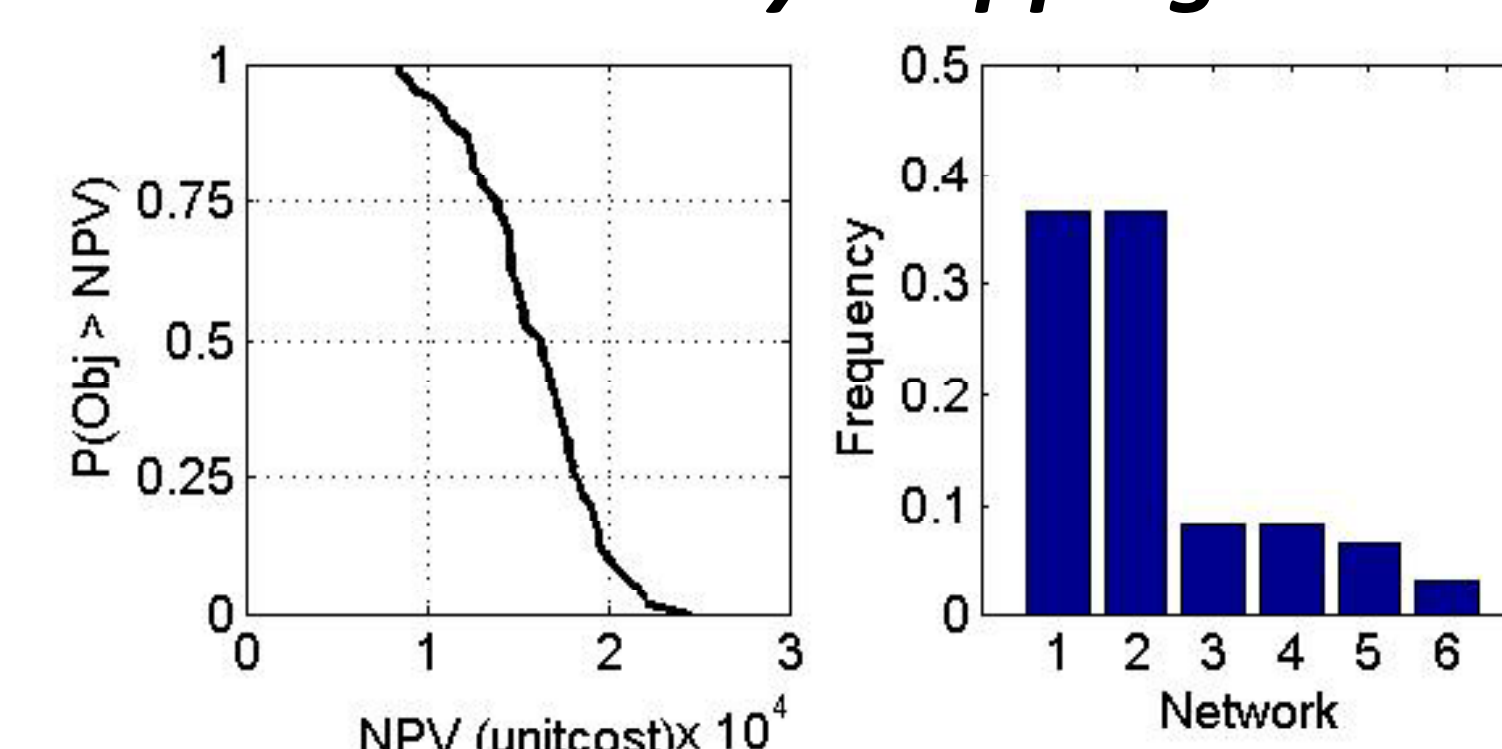
5. Decision Making Under Uncertainty and 6. Hedge against uncertainty



3. Deterministic Solution



4. Uncertainty mapping



7. Report

Solution	NPV (unitcost)	Indicator	Value (unitcost)
DETERMINISTIC	106.6	EVPI	19.3
STOCHASTIC	108.3	VSS	1.8
HEDGING Strat.	115.3 (+8.2%)	VSS_H	8.8

Conclusions

- ✓ Uncertainty is characterized and its consequences on the optimal network is assessed
- ✓ A strategy to hedge against the uncertainty is identified
- ✓ 8.2% NPV improvement is obtained

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